

Remarks upon *Paleohillia*, a problematic fossil plant.

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WITH PLATE XVII.

This genus has lately been established by Mr. F. H. Knowlton, and the description has been published in the *Bulletin* of the Torrey Botanical Club.¹

It is always interesting to learn something about the structure of fossil plants, especially since their manner of preservation very often renders their microscopical examination exceedingly difficult. But even when the preservation permits a closer examination, so that the tissues may be easily observed, we then meet with the difficulty of parallelizing the structure with that of the plants known. It then depends upon the investigator himself whether he is able to point out anatomical characteristics which are sufficient for the classification of the plant in question. If no such conclusion can be reached and especially if we can not even ascertain the character of the fragment, whether it be a stem, a leaf, or a root, we do not feel justified in giving any further record of the specimen, except stating the fact that plants have occurred in the stratum, where the relics were found. We, therefore, do not think it advisable to establish anything like a family or a genus upon such defective fragments, and we take the opportunity to discuss the question in a rather general but comparative way.

The genus *Paleohillia* has been established upon some fragments, said to be hollow stems, the diameter of which is from 5 to 7.5^{cm}, the length of the specimens being several centimeters. The epidermis is described as consisting of elongated and shorter more irregular cells, and the stomata are said to have from four to six guard-cells. The accompanying plate shows a part of Mr. Knowlton's figure (fig. 1) of the epidermis, and we have, also, copied his drawing of a stoma (fig. 2), magnified 300 times.

The first question is now to decide whether the epidermis shows anything so characteristic as to enable us to determine whether the fragment really represents a stem. Considered

¹ 22: 387-90. 1895.

by themselves the epidermis cells do not give us any hint in this direction, except that they seem to differ from those of an ordinary root. The fact that the cells are different in size and shape, viz., that there are bands of elongated cells in alternation with other bands of shorter, more irregular ones, only indicates that the elongated cells may have been situated above some fibro-vascular bundles. This is a very general feature of the mono- and dicotyledonous plants, and such structure is also known from the cryptogams. But whether it is a stem or a leaf can not yet be made out.

The next question is as to the nature of the stomata. Mr. Knowlton states that "these are the most remarkable feature of the plant, because the guardian-cells [*sic*] are quite irregular in shape and appear to vary in number from four to six." It is true that the number of guard-cells about a stoma is not always limited to two, and that the stomata of *Equisetum* and *Marchantia* have more. But as such stomata are entirely different from those figured by Mr. Knowlton, we have copied an illustration of the epidermis with stomata of *Marchantia* (fig. 5), taken from Sachs.²

Mr. Knowlton also states that the "guardian-cells are of course below the epidermal-cells." Combining now the facts in the structure of the stoma of *Paleohillia* we have seen that the number of guard-cells is not constant and that the stoma is situated below the epidermis. We will compare this description with Mr. Knowlton's drawing (fig. 2) and with our figure 6, which we have copied from Van Tieghem.³ Our copy shows only a part of the original illustration so as to give the aspect of the stomata of *Nerium Oleander*. The stomata (*S* in the figure) are in this plant situated in cavities (*cryptes stomatifères*) below the surface of the leaf, and surrounded by the pneumatic tissue. But we fail to find any resemblance between these two figures, and we begin to doubt that Mr. Knowlton really has observed any true stomata.

We will return to his first figure (fig. 1) and consider again the openings, which should contain the stomata. We see then some roundish openings (if not cells?), which are surrounded by four or six cells, a structure that is very familiar

²Sachs, Julius: Vorlesungen über Pflanzen-Physiologie 83. fig. 65 D. Leipzig 1882.

³Van Tieghem, Ph.: Traité de Botanique 60. fig. 33. Paris. 1884.

to us. Cells of that shape and arranged in that manner remind us much of the basal cells of many vegetable hairs, and the resemblance is, indeed, very striking. We have examined a number of hairy plants, and found exactly the same structure. Fig. 3 is for instance the epidermis of a dead stem of the common garden pelargonium, where the hairs have dropped, leaving only the basal cells, which are, however, sufficient to indicate their place. Our next figure (fig. 4) represents also the epidermis of the same plant, but this has been taken from a living stem with the glandular hairs still attached, one of which has been figured. The aspect of this epidermis with the varying number of cells surrounding the base of the hairs does not seem to differ in any respect from the figure of *Paleohillia* given by Mr. Knowlton. And if we now add that bands of elongated cells are also observable in *Pelargonium*, we feel justified to state that the epidermis itself does not give any characteristic whatever so as to lead us to any conclusion.

What we have shown to be the epidermal structure of *Pelargonium* agrees, also, with the stem and leaf of many other plants of widely different families, so that there is no marked characteristic in the epidermis of *Paleohillia*. The fragments of this plant may just as well represent a closed sheath or a terete leaf as a stem, and so far the material seems too poor for the establishment of a new genus with "anomalous structure."

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EXPLANATION OF PLATE XVII.

Fig. 1. Epidermis of *Paleohillia*.—Fig. 2. Stoma of same.—Fig. 3. Epidermis of a dead stem of *Pelargonium*. $\times 500$.—Fig. 4. Epidermis of a living stem of same. $\times 500$.—Fig. 5. Epidermis of *Marchantia*.—Fig. 6. Epidermis of *Nerium Oleander*, transverse section.